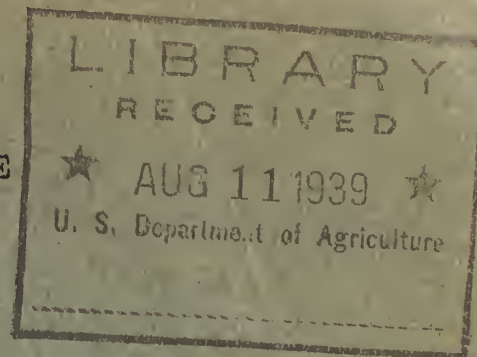


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UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
Region Eight  
Albuquerque, New Mexico



Hugh G. Calkins  
Regional Conservator

NOTES ON JUSTIFICATION OF FLOOD CONTROL PROPOSALS

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UNITED STATES  
DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Albuquerque, New Mexico

June 19, 1937

Dr. Clarence I. Hendrickson  
Bureau of Agricultural Economics  
Department of Agriculture  
Washington, D. C.

Dear Dr. Hendrickson:

Transmitted herewith is a paper entitled "Notes on the Justification of Flood Control Proposals". This statement has been prepared by Mr. Bernard R. Bell, of our staff, and is submitted for your review and criticism.

I should appreciate it if you would let me have your thoughts concerning this statement.

Sincerely yours,

Eshref Shevky  
Bureau of Agricultural Economics  
Representative



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The institution of an extensive program of flood control and the proposal of a large number of specific projects has focused attention upon the question of the economic justification of flood control expenditures. Widespread agreement has been reached upon the proposition that justification must derive from the excess of benefits over costs. To date, however, there has been no agreement upon and insufficient consideration of the nature of either benefits or costs, the methods and techniques of their estimation, and their precise significance. The formula of weighing benefits against costs is simple, but the definitions of what constitute benefits and what constitute costs are exceedingly complex. A variety of concepts and practices are current; consideration of their implications and the development of a sound and uniform method of estimating the economic justification of flood control projects is imperative if a rational and effective national flood control program is to be launched.

The first question to be considered is, what are benefits and how may they be evaluated? This question has  
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been admirably treated by Gilbert F. White, who makes the

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(1) "Economic Justification for Flood Protection" - Civil Engineering, May, 1937; and  
"The Limit of Economic Justification for Flood Protection" Journal of Land and Public Utility Economics, May, 1936.



following points among others: "Benefit is considered to be the gross increase in productivity resulting from elimination or reduction of the hazard of overflow." There are both existing and potential benefits, the former being equivalent to the losses which would occur were it not for flood protection and were there no change in the economic activity of the area subsequent to flood control work. The latter are the additional income resulting from changes in the economic activity of an area as a consequence of flood protection. Benefits, whether existing or potential may be classified also as specific and general. Specific benefits are those accruing to specific properties or interests, e.g., the prevention of damage to land, buildings, goods, railways and highways. General benefits are those which accrue to the community at large and embrace such items as prevention of damage to public health, and prevention of disruption of transportation, communication, and industry.

White makes the suggestion that the decision as to whether or not all these types of benefits should be taken into account is a matter of public policy and should be publicly determined in advance of the technical calculation of economic justification. Whether publicly determined or not, however, it would seem logical that all types of benefits be measured and evaluated in determining the justified expenditure



for flood protection.

This ideal procedure of weighing all benefits , in practise however, faces certain serious difficulties. The most serious of these are those involved in:

1. Projecting over a future period the damages which will occur in the absence of flood control measures.
2. Placing a monetary evaluation upon future damages or benefits.

A series of complicated problems are involved in attempting to project future damages. The basic data necessary are those relating to past damages, their physical character and extent, their correlation with certain hydrologic phenomena, and their monetary evaluation. To those who have investigated these data their deficiencies are discouragingly apparent. While the degree of deficiency varies from drainage basin to drainage basin, it is frequently the case that the hydrologic records extend over an inadequate period, the official records of damage are incomplete and insufficiently detailed so that their appraisal and correlation with hydrologic phenomena are either hazardous or impossible, and the unofficial records, such as newspaper accounts, are notoriously inaccurate. Using these data it is necessary to do one of two things: first, to assume that the past period of years represents an average period and that damages over a like future period will be of





the same character and magnitude. Or, second, to project on the basis of flood-flow probabilities and the physical characteristics of the area the probable future damages, though like damages may never have occurred in the past.

The use of the first procedure is confronted by the fact that frequently there is no evidence in the records to indicate that the assumption as to the average character of the past period is correct. In addition the occupancy and economic activity of the area may have changed, and the physical conditions of the drainage basin may have changed. Finally the record of past damage is frequently incomplete. In sum, the estimates of benefit obtained in this manner are subject to a wide and indeterminable margin of error.

The use of the second procedure faces the fact that hydrologic records are frequently too short to permit accurate prediction of probable flood-flow frequencies, and that the necessary physical and economic data are inadequate to the accurate interpolation of future damages from flood flows. Thus, in either case, the necessity for projection of hypothetical future damages, and the inadequacy of the data essential as the basis for such a projection render any estimates of future damages, or benefits, subject to a high degree of inaccuracy.



Equally complex problems are involved in the attempt to place a monetary evaluation upon future damages or benefits. These problems are most serious in areas where destructible resources, such as cultivable land, are threatened by floods and erosion. While there are difficulties involved in estimating the monetary value of the benefits resulting from the prevention of damage to highways, railroads and buildings, it is possible to devise legitimate means of making such estimates. Such types of property are indefinitely replaceable and have a finite value. To value natural resources in the same manner, however, is to fall into serious error. Agricultural resources are limited and since under proper practices they may remain productive for an infinite period of time they are infinitely valuable.

Yet in almost all discussions of the economic justification of conservation of natural resources, their value is assumed to be only their current market value. The loss of an acre of cultivated land is considered a damage of, for example, \$200 since another acre may be purchased at that cost. The fallaciousness of such reasoning is immediately apparent if the example is extended to cover the several hundred million acres of cultivated land in the United States. The possibilities of simply purchasing other lands would not exist, as in any real sense they do not exist today. The market value of cultivated





land has no relation to its real social value. Market value is determined to a large extent by the income which an individual producer in an exploitative system may derive from a piece of land. In terms of the value of such land to the nation, however, the market exchange system of values is purely fictitious. Its literal acceptance for use in the justification of protection work can easily be disastrous.

From a rigidly practical and realistic point of view almost any expenditure of labor and materials, however great, is "economically sound" if it accomplishes a saving of natural resources. Particularly is this clear if the nature of the expenditures for flood control are examined. The principal expenditure is an expenditure of labor of which it can hardly be said that the supply in the United States is limited in terms of the task of flood control. While it is true that alternative uses of the labor supply of the nation exist, it is difficult to see, if the system of market exchange values is neglected, what use could take precedence in economic soundness over the preservation of the vital resource base of the nation.

In terms of evaluating benefits, then, the principal problem is that of placing a monetary value on the prevention of destruction of land resources. This problem may be further considered in the light of the significance of estimates of benefits and the uses to which they will be put. The variety



of current ideas concerning the use and significance of benefit estimates may be illustrated by reference to official statements.

The following is quoted from the report of the Mississippi Valley Committee:

"Estimates of tangible benefits are useful not only as a basis for assessments but also as a guide for general planning. Tangible benefit is at least a definite visible measure of value, and in the absence of secondary factors of an unfavorable nature, it may well be used in establishing priority of one project over another of the same type. A secondary advantage of giving preference to projects showing tangible benefits lies in the fact that such projects are most likely to command popular approval."(1)

Three different uses of estimates of benefits, as a basis for assessments, for publicity purposes, and for the determination of priorities, are indicated here.

In the most recent statement by the Department of Agriculture, instructions for the determination of benefits are outlined but no specific indications of the use of these data are given. It is implied at several points that benefits will be balanced against costs, and that projects will be justifiable as benefits exceed costs. Thus specific recommendations are requested as to whether a complete flood and erosion

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(1) Report of the Mississippi Valley Committee of the Public Works Administration, 1934, page 217.



control program may be developed "at a cost commensurate with  
(1)  
estimated benefits."

In ~~sum~~, four different concepts concerning the use and significance of estimates of benefits resulting from flood control projects appear to be current; that they may be used for:

1. Publicity purposes
2. Assessment of costs among beneficiaries
3. Determination of justification of specific projects
4. Determination of priorities among projects

The use of estimates of benefits for publicity purposes hardly requires serious consideration at this time. It is to be hoped, at least, that the problem of obtaining public support will not arise until after a sound national program of flood control has been developed.

The problem of collecting data which may be used as a basis for the assessment of costs is complicated by the fact that any distribution of cost assessments must rest primarily upon a policy as yet undetermined. Such a policy when determined, however, will necessarily be based not so much upon

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(1) "Instructions for Preparing Preliminary Examination Reports on Watersheds," February 25, 1937. (Minicographed, Dept. of Agriculture).





the benefits accruable, as upon ability to pay, and upon the abstract fixing of responsibility for the preservation of natural resources upon the proper governmental unit.<sup>(1)</sup>

It is in connection with the proposed use of benefit estimates to determine the justification for a specific project that the question of the value of land resources is especially pertinent. If the proposition that land resources are infinitely valuable is accepted, then clearly it is the responsibility of the nation to protect them and no specific project involving such protection can be deemed unjustified since its costs can never exceed its infinite benefits.

The National Government, through passage of the Flood Control Act, Public 738, has accepted the responsibility for protecting and conserving the resource base, even though in purely fiscal terms, projects designed to accomplish this end will not be self-liquidating. Certain funds will be designated for this purpose but in any given year, or period of years, a limited amount of money will be available. The problem, then, will be, in simple terms, to make this limited amount do the greatest possible good; i.e., priorities among many proposed projects must be established.

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(1) For a full discussion of this point, see "Public Works Planning", National Resources Committee, December, 1936, Part III, Division of Costs and Responsibility.



It seems reasonable to determine priorities on the basis of ratios of average annual benefits to average annual costs. For this purpose it seems legitimate to place some finite value upon land resources, market value being as useful as any, so long as the same system of valuation is used in the case of all projects. Priority may then be given to those projects where the benefit cost ratio is highest.

It is not proposed here to discuss the various formulae used for the preparation of ratios of average annual benefits to average annual costs. In principle, however, whatever formula is used should involve calculation of average annual benefits and costs from the total benefits to accrue and the total costs to be incurred over the life period of the protection works. Furthermore, the same formula should be used in  
(1)  
the case of all justification ratios.

One more point need be made: that, in view of the margin of error involved in benefit calculations, as discussed above, the selection of projects should not be reduced to a mathematical procedure. The ratios developed by the use of uniform definitions of benefit and cost, and of uniform techniques of calculation, should be regarded not as mathematical determinants of the flood control program but as aids to rational planning of such a program.

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(1) For more detailed discussion of the problems involved in the use of various formulae see Gilbert White - previous references.

